Amendments to Claims

Claim 1. (Currently amended) A photoresist comprising

a.) a polymer functionalized with at least one hydroxy ester functional group of the formula:

~~$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,~~

$-CO_2-C(Me)_2-C(Me)_2-OH$

~~wherein~~

~~$n = 0, 1, 2, 3, 4$ or 5;~~

~~$R^1, R^2 = C_1$—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;~~

~~$R^3, R^4 = H$, C_1—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;~~

~~$R^5, R^6 = H$, C_1—C_6 alkyl, or C_1—C_6 alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position~~;

and

b.) a photoactive component.

Claim 2.(Original) The photoresist of Claim 1, wherein said polymer further comprises a fluoroalcohol group or a protected fluoroalcohol group.

Claim 3.(Original) The photoresist of Claim 2, wherein the fluoroalcohol group or protected fluoroalcohol group is derived from at least one ethylenically unsaturated compound containing a fluoroalcohol group having the structure, $-C(R_f)(R_f')OH$, wherein R_f and R_f' are the same or different fluoroalkyl groups of from 1 to about 10 carbon atoms, or taken together are $(CF_2)_n$, wherein n is 2 to 10.

Claim 4.(Original) The photoresist of Claim 3, wherein R_f and R_f' are CF_3.

Claim 5.(Cancelled)

Claim 6.(Currently amended) A photoresist comprising

a.) a polymer comprising at least one repeat unit derived from

~~$H_2C=C(X)-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$~~

$H_2C=C(X)-CO_2-C(Me)_2-C(Me)_2-OH$

wherein X = H, C_1-C_6 alkyl, F, or F-substituted C_1-C_6 alkyl;

~~n = 0, 1, 2, 3, 4 or 5;~~

~~R^1, R^2 = C_1—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;~~

~~R^3, R^4 = H, C_1—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;~~

~~R^5, R^6 = H, C_1—C_6 alkyl, or C_1—C_6 alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;~~

and

b.) a photoactive component.

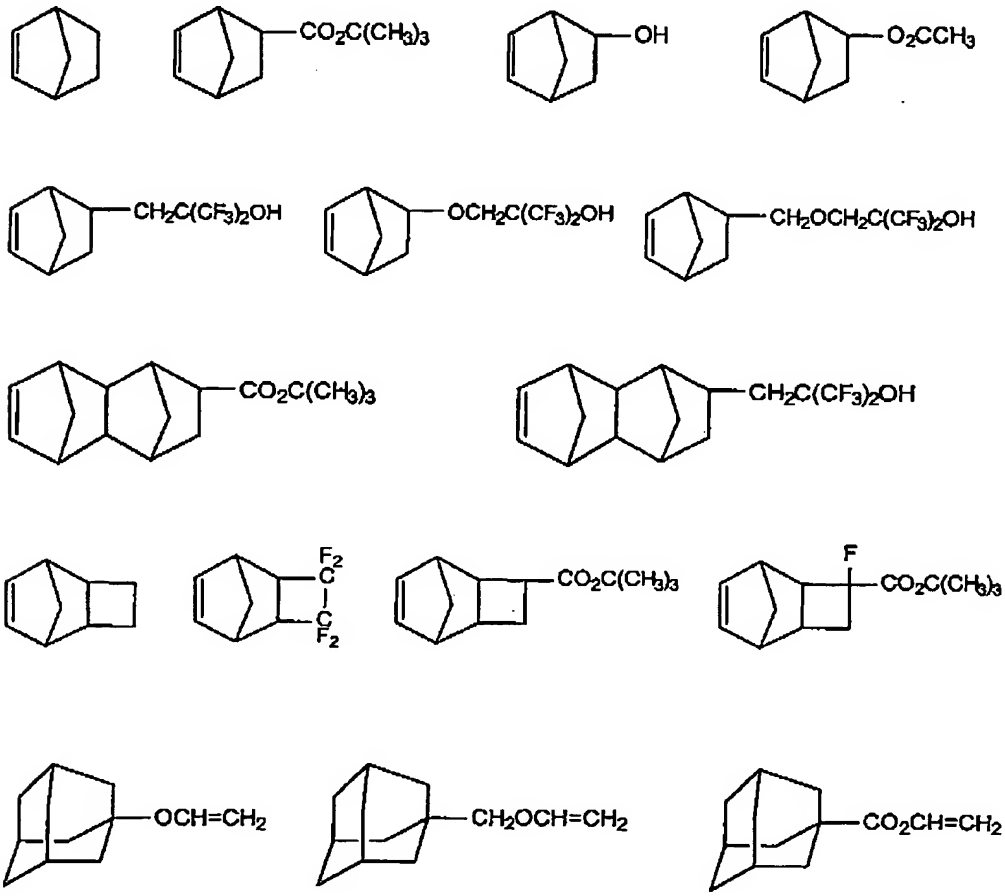
Claim 7.(Original) The photoresist of Claim 6, wherein said polymer further comprises a repeat unit derived from an ethylenically unsaturated compound which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom.

Claim 8.(Original) The photoresist of Claim 7, wherein the ethylenically unsaturated compound is selected from the group consisting of

tetrafluoroethylene, chlorotrifluoroethylene, hexafluoropropylene, trifluoroethylene, vinylidene fluoride, vinyl fluoride, perfluoro-(2,2-dimethyl-1,3-dioxole), perfluoro-(2-methylene-4-methyl-1,3-dioxolane, $CF_2=CFO(CF_2)_tCF=CF_2$, where t is 1 or 2, and $R_fOCF=CF_2$, wherein R_f is a saturated fluoroalkyl group of from 1 to about 10 carbon atoms.

Claim 9.(Original) The photoresist of Claim 6, wherein said polymer further comprises a repeat unit derived from a polycyclic ethylenically unsaturated compound.

Claim 10. (Original) The photoresist of Claim 9, wherein the polycyclic ethylenically unsaturated compound is selected from the group consisting of



Claim 11. (Original) The photoresist of Claim 6, wherein said polymer further comprises a repeat unit derived from monomers selected from the group consisting of acrylic acid, methyl acrylate, ethyl acrylate, propyl acrylate, tert-butyl acrylate, 2-methyl-2-adamantyl acrylate, 2-methyl-2-norbornyl acrylate, 2-methoxyethyl acrylate, 2-hydroxyethyl acrylate, 2-cyanoethyl acrylate, glycidyl acrylate, and 2,2,2-trifluoroethyl acrylate, and the corresponding methacrylate monomers.

Claim 12. (Previously amended) The photoresist of Claim 11, wherein the monomer is selected from the group of tert-butyl acrylate and 2-methyl-2-adamantyl acrylate.

Claim 13. (Original) The photoresist of Claim 6, wherein said polymer further comprises a repeat unit derived from NB-F-OH.

Claim 14. (Currently amended) A copolymer comprising

a.) a repeat unit containing at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,

wherein

n = 0, 1, 2, 3, 4 or 5;

R^1, R^2 = $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

R^3, R^4 = H, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

R^5, R^6 = H, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

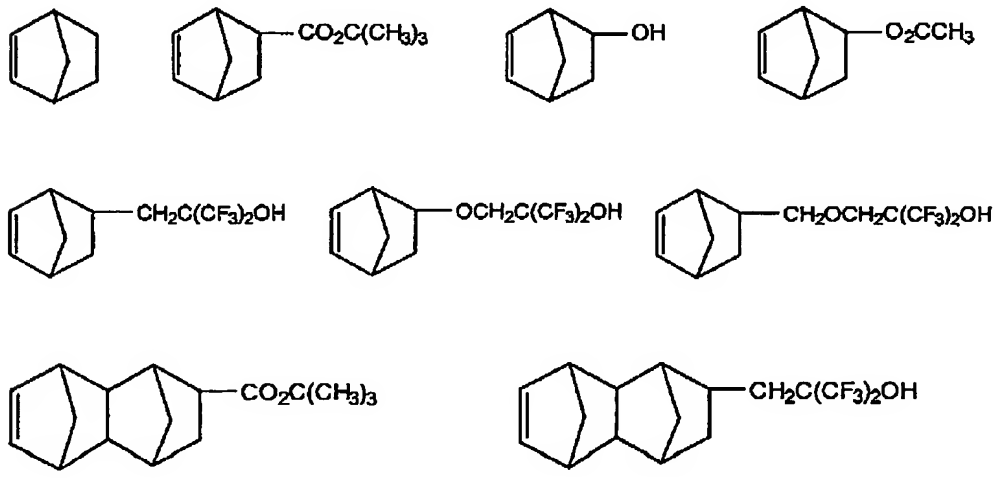
b.) a repeat unit derived from a polycyclic ethylenically unsaturated compound; and

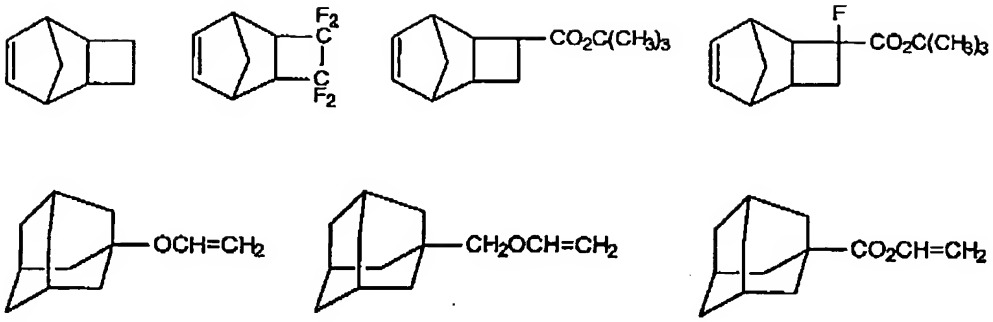
c.) a repeat unit derived from an ethylenically unsaturated compound ~~which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom~~ selected from the group consisting of tetrafluoroethylene, chlorotrifluoroethylene, hexafluoropropylene, trifluoroethylene, vinylidene fluoride, vinyl fluoride, perfluoro-(2,2-dimethyl-1,3-dioxole), perfluoro-(2-methylene-4-methyl-1,3-dioxolane, $CF_2=CFO(CF_2)_tCF=CF_2$, where t is 1 or 2, and $R_f'OCF=CF_2$, wherein R_f' is a saturated fluoroalkyl group of from 1 to about 10 carbon atoms.

Claim 15. (Cancelled)

Claim 16. (Currently amended) The copolymer of Claim ~~15~~ 14, wherein the ethylenically unsaturated compound is tetrafluoroethylene.

Claim 17. (Original) The copolymer of Claim 14, wherein the polycyclic ethylenically unsaturated compound is selected from the group consisting of





Claim 18. (Currently amended) A photoresist comprising

a.) a polymer comprising

i) a repeat unit functionalized with at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,

wherein

n = 0, 1, 2, 3, 4 or 5;

R^1, R^2 = $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

R^3, R^4 = H, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

R^5, R^6 = H, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

ii.) a repeat unit derived from at least one polycyclic ethylenically unsaturated compound; and

iii.) a repeat unit derived from at least one ethylenically unsaturated compound ~~which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom~~

selected from the group consisting of tetrafluoroethylene, chlorotrifluoroethylene, hexafluoropropylene, trifluoroethylene, vinylidene fluoride, vinyl fluoride, perfluoro-(2,2-dimethyl-1,3-dioxole), perfluoro-(2-methylene-4-methyl-1,3-dioxolane, $CF_2=CFO(CF_2)_tCF=CF_2$, where t is 1 or 2, and $R_f'OCF=CF_2$, wherein R_f' is a saturated fluoroalkyl group of from 1 to about 10 carbon atoms; and

b.) a photoactive component.

Claim 19. (Original) The photoresist composition of Claim 18, wherein the photoactive component is a photoacid generator.

Claim 20. (Original) The photoresist composition of Claim 18, further comprising a dissolution inhibitor.

Claim 21. (Original) The photoresist composition of Claim 18, further comprising a solvent.

Claim 22. (Original) The photoresist composition of Claim 21, wherein the solvent is chosen from the group consisting of ether esters, ketones, esters, glycol ethers, unsubstituted and substituted hydrocarbons, aromatic hydrocarbons, fluorinated solvents and supercritical CO_2.

Claim 23. (Original) The photoresist composition of Claim 18, further comprising at least one additive selected from the group consisting of bases, surfactants, resolution enhancers, adhesion promoters, residue reducers, coating aids, plasticizers, and T_g (glass transition temperature) modifiers.

Claim 24. (Currently amended) A process for preparing a photoresist image on a substrate comprising, in order:

(W) coating a substrate with a photoresist composition, wherein the photoresist composition comprises:

a.) a polymer functionalized with at least one hydroxy ester functional group of the formula:

~~$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,~~

$-CO_2-C(Me)_2-C(Me)_2-OH$

~~wherein~~

~~n = 0, 1, 2, 3, 4 or 5;~~

~~R^1, R^2 = C_1—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;~~

~~R^3, R^4 = H, C_1—C_6 alkyl, C_1—C_6 alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;~~

~~R^5, R^6 = H, C_1—C_6 alkyl, or C_1—C_6 alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or~~

~~R^1 and R^5 taken together with $[C(R^3)(R^4)]_n$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;~~

b.) at least one photoactive component; and

c.) a solvent;

(X) drying the coated photoresist composition to substantially remove the solvent and thereby to form a photoresist layer on the substrate;

(Y) imagewise exposing the photoresist layer to form imaged and non-imaged areas; and

(Z) developing the exposed photoresist layer having imaged and non-imaged areas to form the relief image on the substrate.

Claim 25. (Cancelled)

Claim 26. (Cancelled)

Claim 27. (New) A copolymer comprising

a.) a first repeat unit containing at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,

wherein

$n = 0, 1, 2, 3, 4$ or 5;

$R^1, R^2 = C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

$R^3, R^4 = H$, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

$R^5, R^6 = H$, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

b.) a second repeat unit derived from a polycyclic ethylenically unsaturated compound; and

c.) a third repeat unit derived from an ethylenically unsaturated compound which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom.

Claim 28. (New) A photoresist comprising

a.) a polymer comprising

i) a first repeat unit functionalized with at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,

wherein

$n = 0, 1, 2, 3, 4$ or 5;

R^1, R^2 = $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

R^3, R^4 = H, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

R^5, R^6 = H, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or

R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

ii.) a second repeat unit derived from at least one polycyclic ethylenically unsaturated compound; and

iii.) a third repeat unit derived from at least one ethylenically unsaturated compound which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom; and

b.) a photoactive component.

Claim 29. (New) A photoresist comprising

a.) a polymer comprising;

1. at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$,

wherein

n = 0, 1, 2, 3, 4 or 5;

R^1, R^2 = $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

R^3, R^4 = H, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

R^5, R^6 = H, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

2.) a repeat unit derived from NB-F-OH; and

b.) a photoactive component.

Claim 30. (New) A photoresist comprising

a.) a polymer comprising at least one repeat unit derived from

$$H_2C=C(X)-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH$$

wherein X = H, C_1-C_6 alkyl, F, or F-substituted C_1-C_6 alkyl;

n = 0, 1, 2, 3, 4 or 5;

R^1, R^2 = $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

R^3, R^4 = H, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

R^5, R^6 = H, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

b.) a repeat unit derived from NB-F-OH; and

c.) a photoactive component.

Claim 31. (New) A coated substrate comprising

a.) a substrate; and

b.) a photoresist of Claims 1, 6, 18, 28, 29 or 30.

Claim 32. (New) The coated substrate of Claim 31, wherein the substrate is selected from the group consisting of silicon, silicon oxide, silicon oxynitride, and silicon nitride.

Claim 33. (New) A copolymer comprising

a.) a repeat unit containing at least one hydroxy ester functional group of the formula:

$-CO_2-C(R^1)(R^2)-[C(R^3)(R^4)]_n-C(R^5)(R^6)-OH,$

wherein

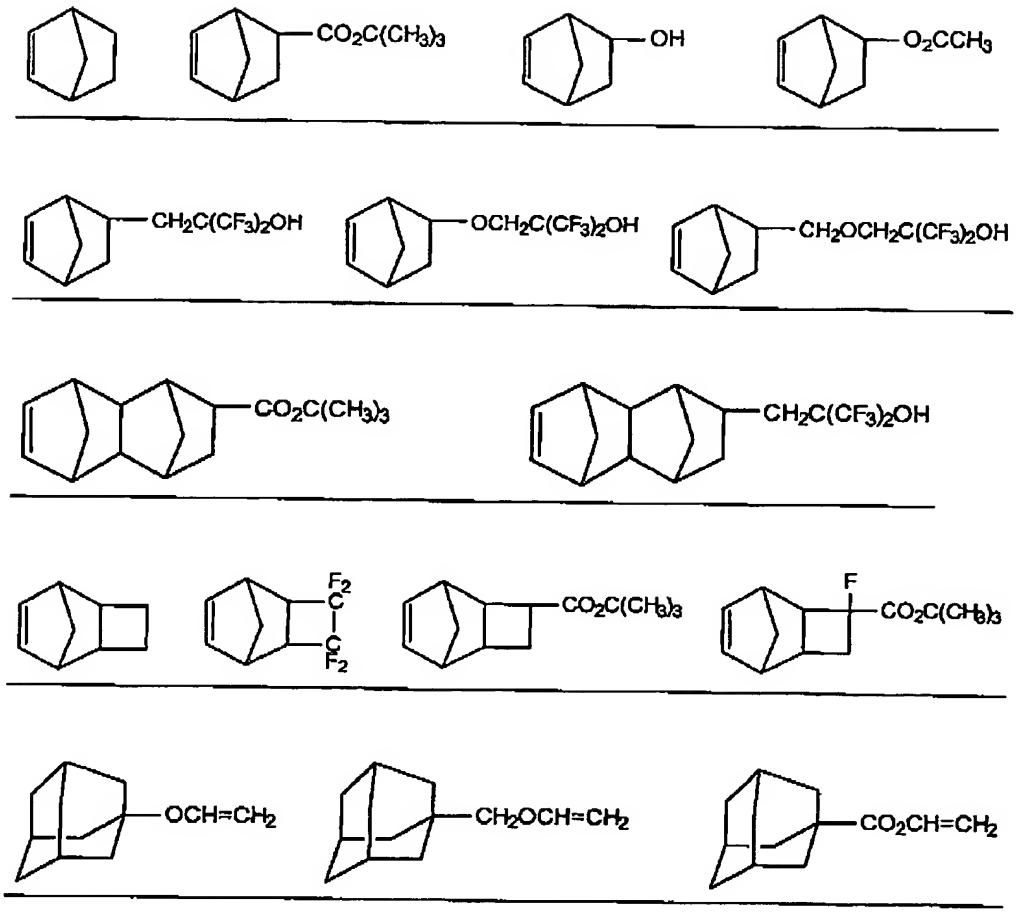
$n = 0, 1, 2, 3, 4$ or 5;

$R^1, R^2 = C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^1 and R^2 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

$R^3, R^4 = H$, $C_1 - C_6$ alkyl, $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^3 and R^4 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen;

$R^5, R^6 = H$, $C_1 - C_6$ alkyl, or $C_1 - C_6$ alkyl substituted with an ether oxygen; or R^5 and R^6 taken together form a 3- to 8-membered ring, optionally substituted with an ether oxygen; or R^1 and R^5 taken together with $-[C(R^3)(R^4)]_n-$ form a 4- to 8-membered ring, provided that the carbon attached to R^1 and R^2 is not at a bridgehead position;

b.) a repeat unit derived from a polycyclic ethylenically unsaturated compound is selected from the group consisting of



and

c.) a repeat unit derived from an ethylenically unsaturated compound, which contains at least one fluorine atom covalently attached to an ethylenically unsaturated carbon atom.